

ENHANCEMENT OF THE EDUCATIONAL ASPECTS
OF
THE EDGE OF THE REEF EXHIBIT
AT THE WAIKIKI AQUARIUM

BY: KENT H. TAKAHASHI

SPONSOR:
THE WAIKIKI AQUARIUM
2777 KALAKAUA AVENUE
HONOLULU, HAWAII 96815
TELEPHONE 923-4725

ADVISOR:
LES MATSUURA
EDUCATION DEPARTMENT

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ABSTRACT

This project was designed to enhance the educational aspects of the Edge of the Reef exhibit at the Waikiki Aquarium, Honolulu, Hawaii.

A single sheet handout (lesson plan) that served as an informative guide to the exhibit was developed and made available to visitors of the aquarium as they entered the display area. The lesson plan focused on the ecology of three different marine environments that are displayed in the exhibit: Tidepool, and two types of coral reefs, Shallow Reef and Quiet Water Shallow Reef. In order to facilitate education and to reinforce the information on the handout an optional 10 question multiple choice, fill in, true/false and matching quiz was developed to compliment the lesson plan. Visitors were made aware, within the content of the lesson plan, of the "fun and games" quiz which could be taken after exploring the exhibit. A grading scale along with a short note of congratulations and thank you was printed on the back of the quiz. Souvenir pins were offered as an incentive/reward to quiz contestants.

A total of 306 lesson plans were distributed at the exhibit site. 58 quiz contestants resulted from the 306 lesson plans handed out. This represented a 19% response figure which equated to 1 quiz contestant out of every 5.3 lesson plans distributed. Scores (out of 10 possible correct answers) ranged from 5-10 correct, with a mean score of 8.2.

Overall, viewers of the exhibit were receptive to the design and approach of the project.

INTRODUCTION

The Waikiki Aquarium was established in 1904, making it the third oldest aquarium in the United States (Waikiki Aquarium, 1987). The Aquarium was founded by private investors and operated as such for fifteen years. Then in 1919 it was placed under the control of the University of Hawaii, hence under State support. The Waikiki Aquarium has been at its present location since 1955. One of the main goals of the Aquarium is to provide a way to educate and inform Hawaii's residents and tourists about the marine environment and thus stimulate an awareness of the ocean and its inhabitants.

Exhibits provide the medium by which education, the ocean and its creatures, and the general public are brought together. People who have never ventured into the ocean's realm as well as people who do are given the opportunity to witness and examine life underwater. An array of tropical reef fishes, corals, eels and seaweeds along with a variety of other organisms are presented up close, in living color, to visitors of the Aquarium.

Along the lines of its goal to "educate and inform", the Waikiki Aquarium has initiated a multitude of educational programs; reef walks, special classes, excursions and lectures are just a few of these programs. The Aquarium also serves, in part, as a research facility, conducting experiments on Mahi Mahi (*Coryphanena hippurus*) cultivation. It also houses the Blue-Water Marine Laboratory, an

educational program for high school students. Amidst the various functions and educational programs lie the heart of the Aquarium, the exhibits. This project focuses on the latest of these exhibits, entitled; "Edge of the Reef."

The exhibit was opened to the public on October 31, 1986. The Edge of the Reef is an outdoor Hawaiian tidepool/coral reef tank that displays within its waters a variety of marine organisms which are associated with these environments. The tank is approximately 40 feet long and roughly 8 feet wide with depths up to 3.5 feet. It is surrounded by a host of native Hawaiian shoreline plants (coastal gardens) which ^{are} also part of the exhibit. The tank and the coastal gardens possess a tremendous "hidden" wealth of information on Hawaii's coastal and shallow reef areas.

GOAL

The goal of this study, consistent with that of the Aquarium and its educational department is to extract this information and present it to viewers of the exhibit so that they may [✓]acquire an understanding of what the display has to offer.

The Aquarium has initiated two means of extracting and presenting this information. One is by a brief informational sign which is posted along with rules of etiquette at the entrance to the display. The other is to have a trained

volunteer stationed at the attraction answering questions and encouraging onlookers to take a further step in experiencing the display by touching some of the marine invertebrates which can be found in Hawaiian tidepool and coral reef environments.

OBJECTIVE

The objective of this study was to design and impliment an additional method of presenting information, in hopes of enhancing the educational aspects of the exhibit.

METHOD

The method used to fulfill the objective of this study was provided through 4 major components: 1) an informative guide to the exhibit (lesson plan), 2) a quiz based on information from the lesson plan and the exhibit itself, 3) a grading scale to determine the ranking of the quiz contestants and 4) souvenir pins which were offered as an incentive/reward to quiz contestants.

FOUR MAJOR COMPONENTS

1. Lesson Plan

The objective of this study was addressed by developing a single sheet handout (lesson plan) that served as an informative guide which visitors of the exhibit could use to better understand the display. Its function was designed to inform and educate. Lesson plans were made available to viewers as they entered the display area.

See Results section, figure 1.

2. Quiz

In order to further enhance and induce learning and allow visitors to apply the information gained from the lesson plan a quiz was developed. It was designed to compliment and support the function of the lesson plan. The quiz was offered within the content of the lesson plan as an "optional fun and games" item which was obtainable upon request.

See Results section, figure 2.

3. Grading Scale

A grading scale which consisted of eleven categories, one for each possible score (0-10) was developed which enabled the quiz taker to see what category he or she fell into. It along with a short note of congratulations and thank you was printed on the back of the quiz. This was designed to make taking the quiz a little more enjoyable and worthwhile.

See Results section, figure 2.

4. Souvenir Pins

Visitors were made aware within the content of the lesson plan of the possibility of earning a souvenir pin. Souvenir pins were developed and offered as incentive/reward to quiz contestants. The pins were designed to lessen the formality and to enhance the appeal of the quiz and lesson plan.

See Results section, figure 3.

The lesson plan and quiz ,hence, the other two components, were designed and directed toward individuals 12 years of age and older who have had little or no experience/education dealing with the marine environment.

DISTRIBUTION OF LESSON PLAN AND QUIZ

Lesson plans were distributed at random to visitors of the aquarium as they entered the display area. An effort was made not to interfere with the educational role of the posted informative sign as well as the volunteer station.

Being the sole investigator of this project and having to give out lesson plans, administer and grade quizzes and handout souvenir pins, I was unable to give, while I was there, every viewer or viewing party a lesson plan. To make sure I could accomodate all interested quiz contestants, no more than 8 lesson plans were allowed to be circulated within the display area at any one time. In addition I had allowed myself to work with 3 clipboards, on which quizzes were issued, consequently, I was able to administer to three contestants at a time.

An opening statement from myself to each individual who was given a handout went something like this: "Hi, would you like some information on the exhibit? You can use this as a guide to the display."

Once people received the handout, I gave them a little time to read through the offering of the quiz. I made a point to approach them again and explain to them a bit more about the quiz . I explained: "If you're interested in taking the fun and games quiz afterward, and receiving one of these souvenir pins," at which point I showed them one of the four or five pins I wore as display models in addition to my name tag, I continued, "just let me know." I often times joked with them that I didn't mean to pressure them but that it was just for their information.

Those individuals willing to take the quiz were supplied with a pencil and clipboard on which the quiz, which appeared in a single sheet format, was attached. They were informed that they could take all the time they needed and that it was a "closed notes" quiz.

After the quiz contestants were finished, I graded their quiz and then flipped it over to the grading scale side. I proceeded to circle the category which their score was in accordance with adding written comments like, "not bad, very good, excellent." I then awarded contestants their souvenir pin, thanked them for participating and wished them well.

MATERIALS

- 3 - Clipboards
- 3 - #2 pencils (new)
- 454 - 8.5 x 11 in. size colored xerox copies
 - 114 - Yellow copies (quizzes)
 - 340 - Blue copies (lesson plans)
- 110 - Souvenir pins
 - 1 - Name tag, worn while conducting investigation at exhibit site.

A sketch design of the souvenir pin was given to Aikane button and ribbon company where upon they manufactured 110 pins, @ 52 cents each. The total bill, including tax, was \$59.58.

An open ceiling on the amount of lesson plans to be xeroxed was incorporated into the project. It was not known how many lesson plans it would take to administer and record the set goal of 100 quizzes. 14 extra quizzes and 10 extra pins, in addition to the requirement of 100 of each, were made to be distributed as samples.

RESULTS

A total of 306 lesson plans were distributed at the exhibit site. 58 quiz contestants resulted from the 306 lesson plans handed out. This represented a 19% response figure which equated to 1 quiz contestant out of every 5.3 lesson plans distributed. Scores (out of 10 possible correct answers) ranged from 5-10 correct, with a mean score of 8.2. See Table 1 on the following page.

A total of 23 hours and 10 minutes, spanning an 11 day period, averaging 2 hours and 6 minutes a day, was spent at the exhibit handing out lesson plans and administering quizzes. See Table 2 on the following page.

The actual lesson plan and quiz (grading scale, congratulatory and thank you note) appear in this section as Fig. 1 and Fig. 2, respectively. A photocopy of the actual souvenir pin is listed as Fig. 3.

TABLE 1:

<u>Score category</u>	<u># of people in category</u>	<u>%accounted for from total quizzes taken</u>
10's	14	24.1
9's	15	25.9
8's	13	22.4
7's	7	12.1
6's	5	8.6
5's	4	6.9

* mean score 8.2

TABLE 2:

<u>April</u>	<u>Time (pm)</u>	<u>Hrs./Min.</u>	<u>Lesson plans distributed</u>	<u>Quizzes distributed</u>
Fri. 17	2:45 - 4:15	1' 30"	15	4
Mon. 20	4:00 - 5:00	1'	10	3
Wed. 22	12:00 - 2:00	2'	32	7
Fri. 24	*11:30 - 3:30	4'	53	8
Sat. 25	1:00 - 3:00	2'	28	0
Mon. 27	2:20 - 4:00	1' 40"	27	7
<u>May</u>				
Mon. 4	2:45 - 4:30	1' 45"	19	2
Wed. 6	*11:30 - 1:00	1' 30"	21	5
Fri. 8	12:15 - 3:30	3' 15"	44	9
Sat. 9	1:00 - 4:00	3'	41	8
Mon. 11	*11:30 - 1:00	1' 30"	16	5
*am		Total	23' 10"	306
				58

EDGE OF THE REEF

Aloha and welcome to the Edge of the Reef exhibit ! This handout is intended to assist you in understanding the display. You may also find the on duty volunteer very helpful.

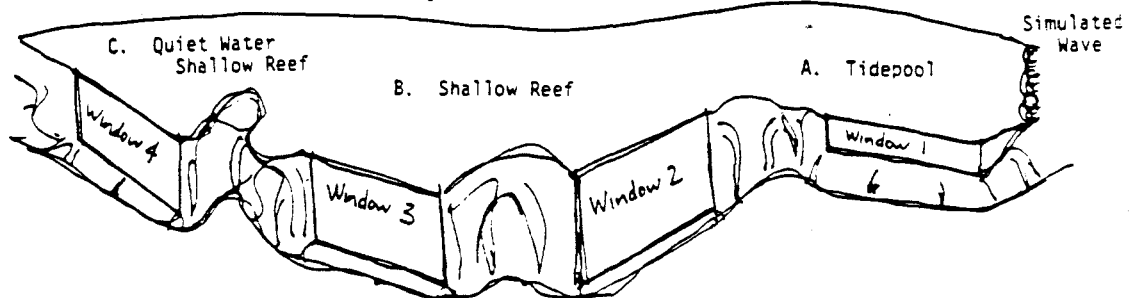
An optional "fun and games" quiz based on information from this handout and the display itself can be taken after exploring the exhibit. Have fun !!! And good luck -

* Souvenir pins are available to quiz contestants.

The vegetation immediately around you is part of the exhibit. Most are native to Hawaii and are examples of the kinds you might encounter along Hawaii's coastal areas. They are adapted to survive in conditions with little rain, poor soil, intense heat, salt mist, and strong winds.

The exhibits feature attraction displays a sample of three different Hawaiian marine environments: Tidepool, and two types of coral reefs, Shallow Reef, and Quiet Water Shallow Reef.

Diagram of Exhibit:



A. Tidepool

Tidepool conditions constantly change with the tides. At high tide some pools may be pounded by crashing waves and swept by swift currents. At low tide others can become isolated from the ocean, unable to receive "cool & fresh" seawater - Like an aquarium without a pump. Plants and animals that live in tidepools are adapted to fluctuations in living conditions caused by the tides. Similar, natural, tidepools can be found along the shoreline at Makapu'u, located on the eastern end of Oahu.

B. Shallow Reef

Coral reefs are among the most productive, diverse, and complex living communities on Earth. Meaning - Coral reefs serve as home to a huge variety of marine plants and animals. Take a close look ! This area represents a shallow reef with moderate wave action similar to conditions found at Hanauma Bay, Oahu.

C. Quiet Water Shallow Reef

Coral reefs take on a slightly different look in areas sheltered from wind and waves. Things appear more tranquil. Plants and animals need not be designed to withstand wave action, consequently, things like seaweeds and corals take on a more delicate and fragile growth form. Water clarity is usually greater here due to less wave action which stirs up sand and sediment. Conditions such as these can be found on the windward coast of Oahu at Kaneohe Bay.

* Interested in a quiz ? Request one if you feel daring.

This handout is provided by a student through an internship program with the University of Hawaii and its Environmental Center and Marine Option Program.

EDGE OF THE REEF QUIZ

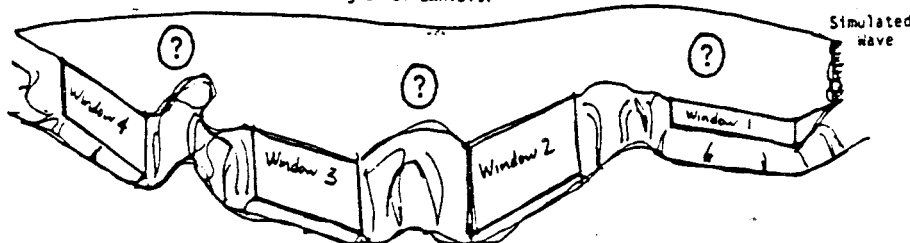
For those who dare to accept the challenge
or
For those who desperately want a souvenir pin

Name: _____

Circle the correct letter (a, b, or c)

1. Plants along Hawaii's beaches are adapted to survive in conditions with:
 - a. Lots of tourist and sun-bathers.
 - b. Little rain, poor soil, and intense heat.
 - c. Snow, wind chill factor, and ice.
2. In what area of the exhibit was the Quiet Water Shallow Reef located ?
Shade in appropriate circle


Diagram of Exhibit:



Fill in the blank




3. At _____ tide some tidepools can become isolated from the ocean, unable to receive "cool & fresh" seawater - Like an aquarium without a pump.

Circle True or False

4. True or False - Coral reefs are among the most productive, diverse, and complex living communities on Earth.
5. This silver fish  which is the Hawaiian Flagtail was about 3 - 4 inches in actual length. It could be seen in the exhibit:
 - a. Swimming close to other larger fish.
 - b. Perched on the bottom, swimming in short bursts.
 - c. Swimming in a school in the Shallow Reef area.
6. This outdoor Hawaiian Tidepool and Coral Reef tank display is called:
 - a. Edge of the Reef.
 - b. Swimming is Fun.
 - c. Edge of the World.

7. The simulated wave flowed directly into what type of marine environment ?
 - a. Tidepool.
 - b. Shallow Reef.
 - c. Quiet Water Shallow Reef.

Match the 3 different marine environments on the left to that which best describes them on the right. Draw a line from the fish to the correct answer.

- | | | |
|-------------------------------|---|--|
| 8. Tidepool |  | * Serve as home to a huge variety of plants and animals. |
| 9. Shallow Reef. |  | * Delicate and fragile growth forms of seaweed and coral. |
| 10. Quiet Water Shallow Reef. |  | * Marine plants and animals adapted to changes in living conditions caused by the tides. |

Turn in Quiz to see how you did !

Edge of The Reef Quiz

Grading scale - Out of 10 possible correct answers -

<u># correct</u>	<u>category</u>
0.	Kite flying is popular at Kapiolani Park
1.	Whale of a tale
2.	No Fillet-O-Fish burgers for a year
3.	Land lubber
4.	Use extreme caution when entering the Ocean
5.	Do not pass Waikiki go directly to Sea Life Park
6.	Snorkel at Hanauma Bay for extra credit
7.	Potential marine biologist
8.	Aquarium director
9.	Jacques Cousteau's research assistant
10.	FISH STATUS - You belong in the Ocean !

Congratulations !! You now join the ranks of an elite group of individuals who have dared to test their intellect and skills and are now worthy to receive the highly prized Edge of the Reef souvenir pin. Wear it in good health. Hope you had fun and enjoyed the exhibit and at the same time learned a thing or two about Hawaii's Coastal, Tidepool, and Coral Reef environments. Come back and visit us again.

Aloha & Mahalo,
Edge of the Reef, Waikiki Aquarium

FIG. 3: SOUVENIR PIN



This is a photocopy of the actual souvenir pin. The pin is 1.75 inches in diameter. The actual coloration of the pin consists of a yellow background with black stenciling.

DISCUSSION

One of the main considerations at the onset of this project and in the development of the lesson plan and quiz was the pondering of the question: "What would be the most important theme, idea, knowledge and information that would be the most practical, beneficial and appropriate to have viewers of this exhibit leave with firmly embedded in their minds?" The conclusion was reached that the best theme suited for this study was to be focused around the three different marine environments that the display presented: Tidepool, shallow coral reef and quiet water shallow coral reef. It is on this premise that the information in the lesson plan and questions on the quiz were based. Both acted in consideration of each other. The end product resulted in a lesson plan and quiz that related directly to the exhibit and its selected theme.

The selection of the theme involved personal observation of the exhibit along with research into the background of the attraction. Consultation with the investigator's advisor and with volunteers who were stationed at the exhibit was vital in assessing the proper theme for the lesson plan and quiz.

One of the keys to the design of the lesson plan was that it be short, entertaining, simple and easy to follow. Early drafts of the lesson plan proved to be too technical in the opinion of advising peers and volunteer workers. Many drafts of the lesson plan were conceived, edited and re-edited. It was very difficult for me personally, to come

up with a final product. It constituted a larger than anticipated portion of my project. Most of the problem was caused because the theme was not concisely defined at the start and that I tended to extract too much technical information from the display. The lengthy duration of the developmental phase of the lesson plan and quiz cut into my time spent at the exhibit distributing lesson plans and administering quizzes. I was able to collect a little over half (58) of my goal of administering and recording 100 quizzes.

The quiz questions were generated simultaneously with the lesson plan. As stated earlier, both the quiz and lesson plan acted in consideration of each other. Like the lesson plan, the quiz had to be short, entertaining and easy to follow. Careful consideration as to the degree of difficulty was necessary in designing a quiz that wasn't discouraging because it was too long and difficult or one that wasn't disappointing because it was too short and easy. Ultimately the quiz ended up in a 10 question multiple choice, fill in, true/false and matching format.

Although there were a few "no thank you"s, initial response to the informative guide was good. Once receiving the lesson plan people reacted in a variety of ways. On one extreme, people would immediately fold it up, stuff it in their pocket and walk right through the exhibit without even breaking stride to glance through the exhibit's windows. On the other extreme, people would start reading the handout, move over to the tidepool area and chronologically go through

the exhibit using the handout as a guide. By observing the reaction of the viewer, which fell somewhere between these two extremes, I could usually tell who would wind up taking the quiz. Although I asked them to request a quiz in my approach I was usually there afterward to ask the potential quiz taker if he or she was ready to take the quiz.

Certain techniques were used to enhance and induce learning. The lesson plan and quiz were both printed on colored paper, blue and yellow respectively, to increase their attractiveness. Souvenir pins were developed and offered to persuade individuals to participate in the quiz, which in turn influenced them to read the lesson plan. A humorous approach was used in some of the quiz questions and in the grading scale to decrease the formality of taking a "test." A sense of challenge which viewers could engage in was meant to be conveyed in the proposition of a quiz.

QUALITATIVE OBSERVATIONS

GENERAL

- Individuals taking the quiz ranged from 8 to around 70 years of age. People in ages from 18-35 seemed to be most responsive to the project.

- 8 year old who sat in front of the display windows and read the lesson plan aloud scored a 9. In another incident, another 8 year old, the only other individual under 12 years of age to take the quiz scored a 5.

- The oldest contestant approximately 70 years old (female tourist) scored a 5.
- Tourists accounted for approximately 85% of quizzes taken.
- As an audience group, local people, including personal friends, were most hesitant to accept the lesson plan.
- Weather conditions influence results - busier on sunny days, did not conduct investigation when raining.
- On slow days, volunteers were able to work one on one with viewers. This seemed to lessen the interest in the handout thus affecting the response to the quiz.
- When animals weren't out, on occasions when they were transferred to the holding tank. The handout seemed to be the only thing which kept the viewers occupied. Hence response was greater.
- Response to the quiz was affected during times when trainers were working with the dolphins.
- Human element/approach seemed necessary for the success of the project. I'm sure if I hadn't approach viewers and left the lesson plans in a brochure stand and sat at the other end of the display with the quizzes I would have had considerably fewer responses.
- Quiz takers seemed to be more interested in their score rather than receiving their souvenir pin.

WEAKNESSES

- Lesson plan appeared to be too wordy. People generally read the first couple lines, skim through the rest and focus on the diagram.

- Quiz question #5 was a good type of observation question but answer (a) seemed a bit too ambiguous. The drawing of the fish could have been better.

- Data cannot be compared to classical survey/questionnaire type data because there wasn't a strict one to one relationship of lesson plans to quizzes. Occasionally a single handout was used by two (in the case of couples) or more (in the case of families) people who took the quiz.

- 4 people took the quiz without receiving a lesson plan. This further validates the point above and suggests that the 19% response figure may be misleadingly high.

- Some people who took the quiz and scored a 9 felt that Jacques Cousteau's research assistant was more of a compliment than, FISH STATUS. People indicated a homocentric point of view and the idea of, FISH STATUS, was not conveyed properly.

STRENGTHS

- The difficulty of the test appeared to be "just right" as figures indicated a trend which was envisioned in the design of the quiz and lesson plan.

- People who scored high (9 or 10) were delighted that they did well. On one occasion, a spirited youth, about nineteen years old raised his arms and shouted "yeah!" as if he had scored a touchdown. Actually he scored a 10. Later he was quoted, "I tore it apart."

- I received encouraging feedback from quiz takers. When I was finished processing quiz contestants they often

remarked, "That was fun." They seemed to be enjoying themselves especially when they were amongst family and friends..

- The quiz seemed to be well designed for family entertainment.

- Some people took the quiz seriously and really studied the handout before taking the quiz. Those individuals scored high.

- Most quiz takers read completely through the handout. I think it's safe to say that they would not have taken the time to read the entire handout had it not been for the quiz.

- Lesson plans and the overall project provided those individuals who wanted to learn more about the exhibit with the means to do so.

CONCLUSIONS

Generally, in consideration of all the factors discussed in the results, overall response was good. The quiz was effective in facilitating education and reinforcing the information on the handout. The souvenir pin was effective not only in offering incentive/reward to quiz contestants but also effective in that it lessened the formality of the idea of taking a "test" as did the humorous approach to some of the quiz questions and grading scale. It is the investigator's belief that the method and approach employed fulfilled the objective of the project by enhancing the educational aspects of the Edge of the Reef Exhibit.

REFERENCE

Waikiki Aquarium. 1987. "About the Waikiki Aquarium:
A brief History." A handout to visitors of the Waikiki
Aquarium.